Automated Cost Recovery
A Feasibility Study

Prepared by

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In Conjunction With

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Prepared for

Montana Department of Transportation

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1. PROBLEM STATEMENT

The purpose of this project is to identify technologies such as smart cards or other cost recovery methods that could be deployed in transit systems in Montana. In short, this project will determine if there are technologies that could be feasibly initiated in transit systems in Montana that could make the process of collecting fares and reporting information to various agencies more effective and efficient.

2. BACKGROUND SUMMARY

Public and specialized transportation (transit) providers in Montana and other states use a variety of methods for collecting fares from riders, invoicing agencies for rides, and collecting ridership data. In urban areas, electronic passes may be used, while in rural areas a simple "paper and pencil" method may be used. While simpler methods may require less infrastructure (computers, communications equipment, etc.), they may actually be less efficient, requiring more time by personnel to consolidate data, invoice for services, and other data management tasks.

Many larger urbanized transit systems are using automated (electronic) methods of collecting fares, tracking ridership data, and invoicing agencies/organizations for rides. Methods may include magnetic strip cards, smart cards, and stored value cards. In addition, some states have implemented statewide software solutions to try and automate as much data collection, analysis and reporting as possible. The CRRAFT (Client Ridership Referral and Financial Tracking) software implemented in New Mexico is one example of this type of software. In addition to customized software packages, commercial off-the-shelf (COTS) systems are available.

The Western Transportation Institute worked with MET Transit of Billings to help identify the benefits of Computer Aided Scheduling and Dispatching Software. These software packages can not only help with the scheduling of demand-responsive systems, but can also help with the analysis of data, including invoicing and other management applications. These software systems can be integrated with fixed route transit systems.

3. OBJECTIVES

The objectives of this research project are to:

1) Review the state-of-the-practice in the transit industry of automated cost recovery systems, and their applicability in Montana;

2) Review current technologies in Montana, such as Montana Access, to see if these systems/technologies could be expanded to include automated cost recovery in Montana's transit systems;

3) Complete a requirements analysis that reviews the business practice of transit systems to determine what issues might affect implementing an automated cost recovery system;

4) Develop a cost/benefit ratio to determine if implementing an automated cost recovery system in Montana is feasible; and

5) Provide an implementation document that will highlight any key barriers, hurdles or issues that would need to be addressed, should a decision be made to implement an automated cost recovery system.

4. BENEFITS

This research project will provide MDT and other relevant agencies (including transit providers) the data necessary to determine whether or not it would be beneficial to implement an automated cost recovery system (or systems) in the state. Potential benefits to MDT include the ability to more easily track ridership, and coordinate with other agencies/departments. Transit providers could benefit by being able to more easily collect fares, invoice agencies for rides, and better track ridership data. Additional departments, such as DPHHS, may benefit by having better data on how their clients/customers are using transportation service, tracking expenditures on transportation services, etc.

This project will provide the data necessary to make a decision of whether or not to proceed with the procurement and implementation of systems or technologies that would aid in automated cost recovery for transit systems. One outcome of this project may be the decision to "test" a system or technology on a pilot project basis.

5. RESEARCH PLAN

This research project has a total of seven tasks, including tasks to review the state-of-practice in automated cost recovery systems, technology levels in transit systems in Montana, and examination of the cost/benefit ratios of various technology options. An outline of the tasks includes:

- Task 1-1 Review current automated cost recovery systems in the transit industry;
- Task 1-2 Review current applications in Montana that could be leveraged to include automated cost recovery functions;
- Task 1-3 Complete a requirements analysis for payment methods, reporting requirements, and other business practices that could impact an automated fare recovery system;
- Task 1-4 Review ADA issues that could impact technologies and their use by persons with disabilities;
- Task 1-5 Develop a cost/benefit analysis for the various technologies reviewed, including life-cycle costs and communication requirements;
- Task 1-6 Create an implementation plan that documents key issues, barriers and hurdles that may be incurred if the project moves forward; and
- Task 1-7 Draft and finalize Final Report and Project Summary Report.

5.1. Tasks

A more detailed description of the project tasks are noted in the remainder of this section.

Task 1-1 Review of current automated cost recovery systems in the transit industry.

Transit providers have different means for collecting fares, billing client agencies, and reporting ridership data. In large urban areas, a transit system may use advanced public transportation systems (APTS), including fare collection systems that utilize smart cards or stored value cards. In small rural areas, transit providers may use cash fares, tokens or punch cards, with information recorded manually by the drivers.

During this task, the WTI Team will review the wide spectrum of transit cost recovery (fare recovery) strategies and document the best practices given agency size, capabilities and customer profiles. The WTI Team will conduct a national literature review to establish a baseline of research that has been documented. Because the majority of Montana's providers are rural, an emphasis will be placed on assessing public transportation cost recovery in rural areas.

The Team will interview regions and states known for their exceptional practices in automated cost recovery. Within each state selected for review, Departments of Transportation, transit agencies, and specialized public transportation agencies will be interviewed. Interviews will cover the range of providers, including:

- Medium and small urban services, such as Missoula, MT and Pocatello, ID, that have basic systems to track ridership and payment types; and
- Rural services encompassing several specialized transit providers, such as Sweetwater County, Wyoming, that have customized solutions for data management and information dissemination that can be operated and managed with virtually no technical staff.

An emphasis during data collection and summary will be to identify whether the specific cost recovery technique is suitable for small urban or rural providers, and how data may be integrated at a statewide level. An emphasis will also be placed on gathering data about challenges faced during automated cost recovery implementation, operations, and maintenance. Where applicable cost information will be gathered as well.

Outcome: A section of the final report that will summarize the current state-of-the practice for transit cost recovery categorized for small-urban and rural providers.

Task 1-2 Review current applications in Montana that could be leveraged to include automated cost recovery functions.

The WTI Team will identify current technologies in Montana that can be utilized for automated cost recovery. There are technologies such as the *Montana Access* card, or transit passes in systems such as Mountain Line in Missoula. In addition, the Team will identify other current technologies owned and operated by public transportation agencies, cities, and other state agencies in Montana.

Each application/technology will be reviewed to determine whether or not it could be expanded or modified to include the ability to provide fare/cost information in a public or specialized transit environment.

Outcome: A section of the final report that will summarize the technologies currently available in Montana to accommodate transit fare payment/cost recovery information.

Task 1-3 Complete a requirements analysis for payment methods, reporting requirements, and other business practices that could impact an automated fare recovery system.

The WTI team will collaborate with MDT, DPHHS, transit providers, and the Montana Transit Association (MTA) to complete a requirements analysis that would document payment methods and invoicing/reporting requirements including data that could be used to refine coordinated transit service and track usage. This process will help to define what systems/technologies may be implemented in the future by transit agencies. These systems/technologies may assist with a

number of functions, including: fare payment, cost recovery, ridership counting (tracking), automated reporting to agencies such as MDT and DPHHS, etc.

The requirements analysis will consider these future systems/technologies to ensure that if any specifications are defined for automated cost recovery systems (Phase Two), that the defined requirements are interoperable, expandable, and compatible with future technologies that may be deployed in transit systems in Montana to the extent possible.

Outcome: A section of the final report that will summarize the requirements of payment methods, reporting requirements and other business practices that would affect the requirements for an automated cost recovery program (system).

Task 1-4 Review ADA issues that could impact technologies and their use by persons with disabilities.

The WTI Team will collaborate with MDT and other appropriate agencies/organizations to review the requirements of ADA, and how the various automated fare recovery technologies may be affected by the ADA guidelines. Issues include how someone with a visual impairment may be able to determine how to enter a magnetic strip card or smart card into a reader, or how someone with a mobility device (such as a wheelchair) could access the card reader.

Due to the nature of transit systems and service in Montana, a sizeable percentage of riders/customers are persons with disabilities. It is therefore important to make sure that the automated cost recovery systems would be as compatible as possible with people with various levels of abilities.

Outcome: A section of the final report that will summarize how the various automated cost recovery systems would work for people with various levels of abilities (or certain disabilities).

Task 1-5 Develop a cost/benefit analysis for the various technologies reviewed, including life-cycle costs and communication requirements.

All identified alternatives available to MDT for automated cost recovery implementation in the state will be provided. For each of the alternatives, a feasibility study including the cost, benefits, and challenges will be identified. This analysis will help MDT determine whether or not the system could have a positive impact on transit providers (and state agencies/departments).

The cost analysis will include the cost per vehicle and system costs (e.g. hardware, software, programming, communications, and maintenance costs) for each of the technologies. In addition, the WTI Team will identify additional infrastructure that may be necessary to implement each of the systems/technologies, such as additional communication capabilities, training costs, etc. Finally, the life-expectancy of the various components (various technologies) that may be implemented will be examined so that a "total cost" over a period of 10 (or 20) years could be estimated for planning/implementation purposes.

The benefit portion of the analysis will include any possible reduction in staff time (to the transit providers and other agencies) and the recovery of additional fares (costs). Additional benefits such as automating reporting requirements will also be included.

Challenges or drawbacks for implementation and operations of these alternatives will also be identified. Challenges may include whether or not the system can be implemented statewide, if it is feasible to implement in rural areas, time associated with implementation, etc.

Outcome: A section of the final report that will summarize the cost/benefits analyses for each alternative.

Task 1-6 Create an Implementation Plan that highlights key issues if a decision is made to move forward with implementation.

Based on all of the alternatives identified in Task 1-5, and all other information gathered in previous tasks, the WTI Team will provide recommendations as to whether or not it appears feasible to implement automated cost recovery systems in Montana. The research may indicate that the technology may only be feasible in certain areas (small-urban areas) in the state. The implementation plan will also highlight key issues (barriers and/or hurdles) that may be faced if a decision is made to implement the recommended systems/technologies. In addition, the Implementation Plan would provide recommendations on performance measures, how to evaluate the various technologies or systems that may be implemented. Finally, a high level discussion on how all the various costs may be distributed among the various agencies/organization (local provider, DPHHS, MDT, etc.) will be included.

Outcome: A section of the final report that will summarize the key issues if a system or technology is implemented.

Task 1-7 Draft and finalize the Final Report and Project Summary Report.

Based on MDT guidelines, the WTI Team will draft a Final Report and Project Summary Report. The Final Report will include all of the information relevant to Tasks 1-1 through 1-6. A draft of the Final Report and Project Summary Report will be provided to the Technical Panel for a six-week review. Based on relevant comments from the Panel, the WTI Team will then finalize both reports.

Task 2-0 Project Management

The research team believes that keeping the sponsor informed throughout the project is crucial to the project's success; therefore, the project management task is an important part of the research plan. This task includes the kick-off and final meetings, as well as the quarterly progress reports that will be provided.

6. PRODUCTS

In order to provide MDT and the Technical Committee the ability to review the work by the WTI Team, the following deliverables (reports) are proposed.

- Progress Reports – a report will be sent to MDT and the Technical Committee at the end of each calendar quarter of work on this project so that progress on tasks can be reviewed. The progress reports will list progress on the project and tasks, and any issues encountered during the quarter.

- Draft Final Report – a draft of the final report will be provided to MDT and the Technical Committee that includes all of the information gathered in Tasks 1-1 through 1-6.

- Final Report and Project Summary Report – a report which incorporates the comments on the draft report from the Technical Committee will be finalized (the "Final Report"), and a project summary report will be delivered. All reports will conform to Montana Department of Transportation guidelines, documenting the activities carried out, the findings discovered, and the resulting recommendations.

7. IMPLEMENTATION

The outcomes of this research project will be reported to MDT in a series of quarterly progress reports, and a final report. The project will gather and analyze data so that MDT can decide if there is a high enough level of benefits, to move toward implementation of an automated cost recovery system in Montana.

The information from this report will also address critical strategic issues in the implementation of the system, and provide for the coordination of efforts between MDT and other agencies/departments, including transit providers.

8. TIME SCHEDULE

The proposed schedule for this project is shown in Table 1. The schedule is based on beginning the project November 6, 2006.

Table 1: Project Schedule

Activity/Task	Nov. 06	Dec. 06	Jan. 07	Feb. 07	Mar. 07	Apr. 07	May. 07	Jun. 07	Jul. 07	Aug. 07	Sep. 07	Oct. 07	Nov. 07	Dec. 07
Kick-off Mtg	■													
Task 1-1 State of Practice		■	■	■	■	■								
Task 1-2 Tech in MT		■	■	■	■	■								
Task 1-3 Req's Analysis		■	■	■	■	■								
Task 1-4 ADA Issues					■	■	■							
Task 1-5 Cost/ Benefit Analysis					■	■	■	■	■					
Task 1-6 Implementation Plan								■	■	■	■	■		
Task 1-7 Final Reports										■	■	■	MDT Review - Final Reports	
Task 2-0 Project Management	■	■	■	■	■	■	■	■	■	■	■	■	■	■

9. STAFFING

The Western Transportation Institute (WTI) will work with Mr. Richard Hodges to form a Team with experience in public transportation (transit) technologies, including automated cost recovery and automated fare payment systems. From the identification of stakeholder needs and literature review, elicitation and formulation of requirements, and the identification and evaluation of alternatives, team members have the ability to complete the tasks identified in this document to assist MDT and other relevant partners in the process of deciding whether to implement automated cost recovery technologies in Montana transit systems. The team will include:

David Kack, Principal Investigator, is a Research Associate at WTI with six years of experience in transportation coordination, management, and planning. He served on the team that developed the *Montana Coordinated Transportation Handbook*, and recently completed a follow-up project to deploy the coordination principles in two pilot communities (the Real Choices Systems Change Grant project). Mr. Kack also developed a comprehensive service improvement plan for GALAVAN, an FTA Section 5310 transportation provider in the Bozeman area that primarily services senior citizens and persons with disabilities. David is currently the Chair of the GALAVAN Advisory Board. He has also managed projects to assist public transit agencies in Billings, Big Sky and the Fort Peck Indian Reservation. Mr. Kack is a member of the Montana Transit Association, the Community Transportation Association of America; and is also a member of the Transportation Research Board's Rural Public and Intercity Bus committee. Prior to joining WTI, Mr. Kack was the Planner for the Metro Area Transit System in Fargo, North Dakota, as well as the Administrator for the Fargo-Moorhead Transportation Management Association.

Doug Galarus is a Senior Research Associate at WTI and Program Manager for the Systems Engineering, Development and Integration Program. He has more than 15 years experience in information technology development, testing, and implementation. He has extensive experience as the project lead for mobile data communications systems, database-driven web sites, web site design, desktop applications, kiosk development, PDA and Tablet PC –based development, and interactive CD-ROMs. At the Western Transportation Institute, he has applied his technical expertise to the development of specific applications for transportation safety, including improved tools for road weather management, rural communications, and incident management. He has taken the lead for an interdisciplinary initiative to develop a Center for Transportation Systems Engineering and Integration at WTI and leads in the design, prototyping, evaluation, and deployment of innovative systems. He currently serves as the Co-Principal Investigator for a project to provide the information elements, framework and pilot deployment of an incident information collection/incident support system for rural field office of the California Department of Transportation. He also serves as the Co-Principal Investigator on the project to conduct the requirements analysis for the new road condition reporting system at MDT. Mr. Galarus holds a Master's degree in Computer Science.

Richard Hodges is now a private transportation consultant based in Salt Lake City, UT having recently retired from the Utah Transit Authority (UTA) where he was employed as the Technology Development Manager from 2004 until April 2006, having served as the ITS Project Manager at UTA from 1999 until 2004. From 1989 to 2004, Richard was employed as Economist at Utah Transit Authority. Mr. Hodges has been involved in many activities, as he is the past Chair of the Salt Lake Region Traffic Management Committee, has participated in the

development of the Salt Lake Regional ITS Architecture, the Utah Valley ITS Architecture, the Utah statewide ITS Architecture and the deployment of 511 in the Salt Lake region. His work on Utah Transit Authority's ITS projects included automated passenger counters, Automated Vehicle Location, electronic fare collection research and demonstration program, transit enhancements to Utah's 511, customer information services and Connection Protection on UTA's light rail system. Richard has recently worked with the National Transit Institute to help develop new coursework in the area of technology staffing and is a recognized transportation professional with particular expertise in transit, Intelligent Transportation Systems (ITS), transportation technology, environmental analysis, transportation costs, bicycle and pedestrian issues. He developed the core financial, environmental and cost analysis for the development of Utah Transit Authority's light rail transit and bus system. He has a Bachelor's and a Master's degree in Economics from the University of Utah with emphasis in Environmental Economics and Economic Development.

The hours each of these people and others will spend on the project is identified in Table 2.

Table 2: Project Hours by Person

Individual	Role	Hourly Rate	Benefit Rate	Tasks								
				1-1	1-2	1-3	1-4	1-5	1-6	1-7	2-0	Total
David Kack	P.I.	$29.31	$ 9.97	60	96	96	24	112	124	96	80	688
Doug Galarus	Tech. Info.	$46.74	$14.02	4	8	8	4	16	8	8	0	56
Shaowei Wang	Tech. Info.	$21.61	$ 8.21	24	80	24	16	80	40	24	0	288
Undergrad Student	Research	$ 9.41	$ 0.47	80	80	80	40	80	80	40	0	480
Richard Hodges	Subject Expert	$80.00	$ -	86	20	84	12	88	102	40	48	480
Jeralyn Brodowy	Admin Support	$29.90	$10.47	0	0	0	0	0	0	0	8	8
Carla Little	Writing/editing	$18.27	$ 7.68	0	0	0	0	0	0	80	0	80
TOTAL				254	284	292	96	376	354	288	136	2,080

10. FACILITIES

The facilities needed for the research project include those already existing at the Western Transportation Institute, as well as at the office of Mr. Richard Hodges. Equipment necessary for this project includes personal computers with Internet and e-mail capabilities, telephones and fax machines.

11. MDT INVOLVEMENT

MDT will have a sizeable involvement in this project. Involvement will range from managing the Technical Panel that will oversee this project, to providing data and contacts on existing technologies within MDT that could be used for automated cost recovery purposes, to providing contacts and ensuring support from transit providers and other agencies/organizations.

The research plan indicates that many of the tasks rely on gathering information from a variety of sources. Support from MDT will help the WTI Team gather the necessary data from other agencies/departments in Montana, including transit providers in the state.

12. INVOLVMENT OF OTHER ORGANIZATIONS

In addition to MDT, other organizations may have significant involvement in this project. As noted earlier, *Montana Access*, a smart card used by the Montana Department of Public Health and Human Services (DPHHS) is one technology that will likely be investigated to determine if it could be leveraged for public/specialized transportation purposes. Based on this technology, and possibly others within DPHHS, it is likely that DPHHS will have a sizeable role in this project. Another organization that may have a role is the Montana Transit Association (MTA). MTA may be used to survey its members to determine what cost recovery issues they have, and what role, if any, they see technology playing to help them with their cost recover/payment issues.

Which organizations and how much they may be involved cannot be determined at the outset of the project. It is important to the project, however, that organizations such as DPHHS, MTA and others see the benefit of this project, and will participate as necessary.

13. BUDGETS

The proposed budget for the project is not to exceed $106,100. Table 3 shows the project budget, while Table 4 shows the budget according to Federal Fiscal Years, and Table 5 shows the budget according to State Fiscal Years. Table 6 shows the split in project funding between MDT and WTI.

Table 3: Total Project Budget

Task	Task Description	Labor Hours	Labor Cost	Sub-contract	Travel	Ops/ Comm.	Indirect	Total Dollars
1-1	State of Practice	254	$4,106	$6,880	$0	$0	$2,207	$13,193
1-2	MT Technologies	284	$7,433	$1,600	$90	$0	$1,833	$10,956
1-3	Req's Analysis	292	$5,763	$6,720	$1,000	$70	$2,722	$16,275
1-4	ADA Issues	96	$2,058	$960	$100	$150	$656	$3,924
1-5	Cost/Benefit	376	$8,548	$7,040	$0	$0	$3,131	$18,719
1-6	Impl. Plan	354	$7,340	$8,160	$905	$0	$3,295	$19,700
1-7	Final Reports	288	$7,444	$3,200	$0	$0	$2,138	$12,782
2-0	Project Mgmt.	136	$3,465	$5,040	$280	$0	$1,765	$10,550
Project Totals		2,080	$46,157	$39,600	$2,375	$220	$17,748	$106,100

Table 4: Project Budget by Federal Fiscal Year

Federal FY	Source	Labor Hours	Labor Cost	Sub-contract	Travel	Ops/ Comm.	Indirect	Total Dollars
	MDT	858	$18,988	$22,000	$0	$0	$5,696	$46,684
	WTI	978	$21,630	$12,848	$1,190	$220	$9,922	$45,810
FY 07	FY 07 Total	1,836	$40,618	$34,848	$1,190	$220	$15,618	$92,494
	MDT	114	$2,589	$3,000	$0	$0	$777	$6,366
	WTI	130	$2,950	$1,752	$1,185	$0	$1,353	$7,240
FY 08	FY 08Total	244	$5,539	$4,752	$1,185	$0	$2,130	$13,606
Project Totals		2,080	$46,157	$39,600	$2,375	$220	$17,748	$106,100

Table 5: Project Budget by State Fiscal Year

State FY	Source	Labor Hours	Labor Cost	Sub-contract	Travel	Ops/ Comm.	Indirect	Total Dollars
	MDT	647	$13,594	$15,750	$0	$0	$4,078	$33,422
	WTI	738	$15,485	$9,198	$1,190	$220	$7,103	$33,196
FY 07	FY 07 Total	1,385	$29,079	$24,948	$1,190	$220	$11,181	$66,618
	MDT	325	$7,983	$9,250	$0	$0	$2,395	$19,628
	WTI	370	$9,095	$5,402	$1,185	$0	$4,172	$19,854
FY 08	FY 08Total	695	$17,078	$14,652	$1,185	$0	$6,567	$39,482
Project Totals		2,080	$46,157	$39,600	$2,375	$220	$17,748	$106,100

Table 6: Project Budget by Funding Source

Item	MDT	WTI	Total
Labor	$21,577	$24,580	$46,157
Subcontract	$25,000	$14,600	$39,600
Travel	$0	$2,375	$2,375
Operations/Comm.	$0	$220	$220
Indirect	$6,473	$11,275	$17,748
Totals	$53,050	$53,050	$106,100